

Project Description "Graph Type Transformations"

GAIN - Graphs in Artificial Intelligence and Neural Networks

October 2021

Both scientific and non-scientific problems or applications can be modeled as graphs. Different graph types are presented in the paper "Graph Type Expressivity and Transformations" (<https://arxiv.org/pdf/2109.10708.pdf>), and transformation algorithms from one to another graph type. These can later help in the study of many problems modeled as graphs. The goal is to have a python package at hand that facilitates the use of these algorithms.

1 Goals

- Creation of a Python package for transformations from one to another graph type (based on the paper: <https://arxiv.org/pdf/2109.10708.pdf>)
- Extension of the algorithms (in algorithm type or optimized versions)

2 Prerequisites

- Basic knowledge: mathematics
- Python programming skills: at least intermediate level
- Software development skills: at least intermediate level
- Knowledge of unit testing

3 Student's tasks

- Create a python package in git
- Implement all the transformation algorithms from the paper mentioned above
- Extend the set of algorithms using optimizations
- Create a unit test for all the algorithms
- Write a documentation of the package
- Write a project thesis (suggested chapters: introduction, algorithms in paper, optimizations, implementation, discussion, outlook)

4 Supervisor's tasks

- Supervision online via zoom/dfn or in person if possible
- Short introduction
- Frequency: starting weekly, 1h, and then on demand (e.g., discussion, suggestions, evaluation, debugging)
- Provide a template for the project thesis

5 Grading criteria

- Academic approach: Literature review, selection of optimizations, selections of tests, etc.
- Programming style and documentation
- Project thesis

6 Used Languages

- Package in English
- Supervision: Deutsch/English
- Documentation: English
- Project Thesis: Deutsch/English

7 Conditions

- Credits: Depending on the examination regulations
- Timespan: 12 weeks (can be negotiated)